



SURVEY REPORT

Jervis Bay Mussel Farm, NSW

For

DPI

27/01/2025

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General Information

Survey Class	NA
Hydrographic Surveyor	Ben Gray CPHS1 Paul Davies
Survey Dates	18/12/2024
Purpose of Survey	Hydrographic Survey
Port	Jervis Bay
Regional Harbour Master	NA
Survey Areas	Proposed Mussel Farm

Reference documents

Rev No	Issue Date	Revision Details	Prepared By	Reviewed By	Approved By
0	27 January 2025	For review	Ben Gray	Ben Gray	Ben Gray

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ABBREVIATIONS

The following abbreviations may be used in this document

AAPMA	Association of Australian Port and Marine Authorities
AGD	Australian Geodetic Datum
AHD	Australian Height Datum
AHSCP	Australasian Hydrographic Surveyors Certification Panel
AMG	Australian Map Grid
BM	Bench Mark
CD	Chart Datum
CoG	Vessel Centre of Gravity
CoR	Vessel Centre of Rotation
CPHS1	Certified Practicing Hydrographic Surveyor Level 1
DGPS	Differential Global Positioning System
DTM	Digital Terrain Model
GAMS	GPS Azimuth Measurement Subsystem
GDA94	Geodetic Datum Australia 1994
GDA2020	Geodetic Datum Australia 2020
GNSS	Global Navigation Satellite System
HAT	Highest Astronomical Tide
ICSM	Intergovernmental Committee on Surveying and Mapping
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
kHz	Kilohertz
LAT	Lowest Astronomical Tide
MBES	Multi Beam Echo Sounder
MGA94	Mapping Grid of Australia 1994
MSL	Mean Sea Level
MRU	Motion Reference Unit
PDOP	Position Dilution of Precision
POSMV	Position Orientation System for Marine Vessel
PSM	Permanent Survey Mark
PTA	Performance Test Area
RL	Reduced Level
RMSE	Root Mean Square Error
RMS	Refer Manufacturer Specifications
RTK GPS	Real Time Kinematic Global Positioning System
SSSI	Surveying and Spatial Sciences Institute
SBES	Single Beam Echo Sounder
SSM	State Survey Mark (PSM)
SVP	Sound Velocity Profile
SVS	Sound Velocity Sensor
TBM	Tidal Bench Mark / Temporary Benchmark
UPS	Uninterruptible Power Supply
UTM	Universal Transverse Mercator
VDOP	Vertical Dilution of Precision
VRF	Vessel Reference Frame
WGS84	World Geodetic System 1984

1 INTRODUCTION

Astute Surveying Pty Ltd has been contracted by DPI to undertake a hydrographic survey over the proposed Mussel Farm area, Jervis Bay. The surveys are being used to assess areas for any heritage related objects on the seabed. This report covers the GNSS control used, vessel, equipment, survey method and checks conducted while undertaking the surveys.

2 STANDARDS

This survey complies with the latest versions of relevant codes and standards for a single beam investigation survey:

- IHO S-44 - Standards for Hydrographic Surveys
- AAPMA - Standards for Hydrographic Surveys within Australian Waters
- ICSM - Australian Tides Manual - Special Publication No.9

3 PROJECT PARTICULARS

3.1 Client

DPI

3.2 Project Details

Conduct high resolution Multibeam Hydrographic Survey within the Orange polygons



Figure 1 – Jervis Bay Survey Areas

4 PERSONEL

Surveys were directly supervised on-site by a CPHS Level 1 Surveyor.

Ben Gray (Supervising)

CPHS Level 1 (SSSI AHCP) MSSSI

Bachelor of Spatial Sciences MSQ

Astute Surveying Pty Ltd

18+ Years of continuous hydrographic survey operations

Paul Davies – Survey assistant

5 PROJECT HORIZONTAL AND VERTICAL DATUM

5.1 Horizontal Datum

The project horizontal datum used is the Geocentric Datum of Australia 2020 (GDA2020) with coordinates projected onto the Map Grid of Australia 2020 (MGA2020) Zone 56.

Table 2 below lists the key settings for the datum.

PARAMETER	VALUE
Datum	Geocentric Datum of Australia 2020 (GDA2020)
Reference Frame	International Terrestrial Reference Frame 2014 (ITRF2014)
Ellipsoid	GRS80
Semi Major Axis	6,378,137.0 meters
Inverse flattening	298.257222101
Projection	Map Grid of Australia 2020 (MGA2020)
Projection Method	Universal Transverse Mercator (UTM),
Zone	56
Latitude of Origin	0° S
Longitude of Origin	153° E
Scale factor at Origin	0.9996
False Easting	500,000m

PARAMETER	VALUE
False Northing	10,000,000m

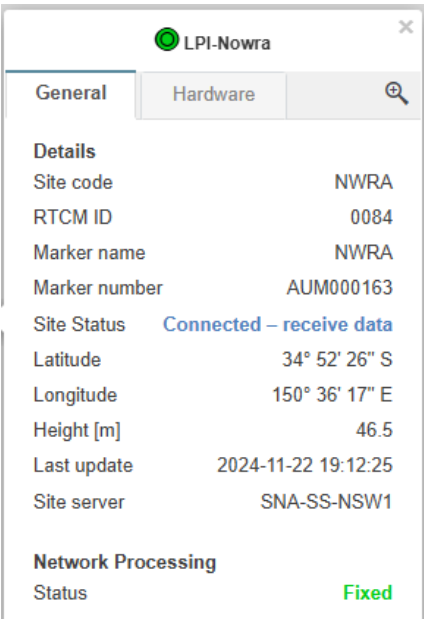
Table 1: MGA2020 parameters

5.2 Vertical Datum

Depths were determined relative to the GDA2020 ellipsoid, Australian Height Datum

6 SURVEY CONTROL

The existing AUSCORS Nowra GPS Base Station was used



The screenshot shows a software window titled "LPI-Nowra" with a close button in the top right corner. It features two tabs: "General" (selected) and "Hardware". Under the "General" tab, there is a "Details" section containing the following information: Site code (NWRA), RTCM ID (0084), Marker name (NWRA), Marker number (AUM000163), Site Status (Connected – receive data), Latitude (34° 52' 26" S), Longitude (150° 36' 17" E), Height [m] (46.5), Last update (2024-11-22 19:12:25), and Site server (SNA-SS-NSW1). Below this is a "Network Processing" section with a Status of "Fixed".

Details	
Site code	NWRA
RTCM ID	0084
Marker name	NWRA
Marker number	AUM000163
Site Status	Connected – receive data
Latitude	34° 52' 26" S
Longitude	150° 36' 17" E
Height [m]	46.5
Last update	2024-11-22 19:12:25
Site server	SNA-SS-NSW1
Network Processing	
Status	Fixed

Table 3: GNSS base station details

7 SURVEY EQUIPMENT

Primary Survey Equipment and Software

7.1 Survey Vessel

The hydrographic survey was carried out from Astute Surveying’s survey vessel Coastal Explorer.

Type:	Aluminium Single hull.
Length:	6m
Beam:	2.4m
Draft:	0.3m
Propulsion:	200hp Suzuki outboard

7.2 Bathymetry Systems

Type:	Norbit i77h
Transducer Frequencies:	400 kHz
Beams:	1024
Motion Compensation:	Ocenmaster
Ping Rate:	20Hz+
Installation:	Over the Side
Limiting Sea Conditions:	Primarily aeration of transducers at > 1.5m swell

The Multibeam Echo Sounder is mounted on an over the side pole located on the port side, close to midship and 0.06m from the centreline. The pole and mounting arrangement is designed to minimize flex and utilises specialised brackets on the side of the hull to ensure the pole locates to an identical position each time it is attached. The mount has been tested (by subsequent bar checks and patch tests) to accurately fit back to its original position each time the vessel is used for survey.

7.2.1 Position and motion sensor

- Reach RS2 GNSS
- The antenna is mounted directly above the transducer with unimpeded access to satellites.

7.2.2 RTK Rover

- Emlid Reach RS3

7.2.3 Radio RTK correction data receiver

- 4G

7.2.4 Sound Velocity Probe

- AML Base X SVP – direct Sound Velocity profile measurement

7.2.5 Acquisition and Processing Software

Hypack 2024 is a powerful and specialised package by Hypack for multibeam data collection and processing. It allows users to design a survey, for both single and multibeam data, collect and edit the data, and post process it to create contours, cross-sections, volumes, TIN Models etc.

7.2.6 Calibration

Prior to any survey work the following checks were made to ensure the equipment was returning the correct information to the survey software. The data entered in the software was also checked by carrying out these tests.

7.2.7 Base Station

The base station operation was checked by measuring with a Emlid Reach RS3 receiver at known high order bench a mark using constrained centring (tilt compensated). This was to test the horizontal and vertical position of the Raymond Terrace base station (FTD2). An accurate result proved the integrity the Base Station and GPS rover unit.

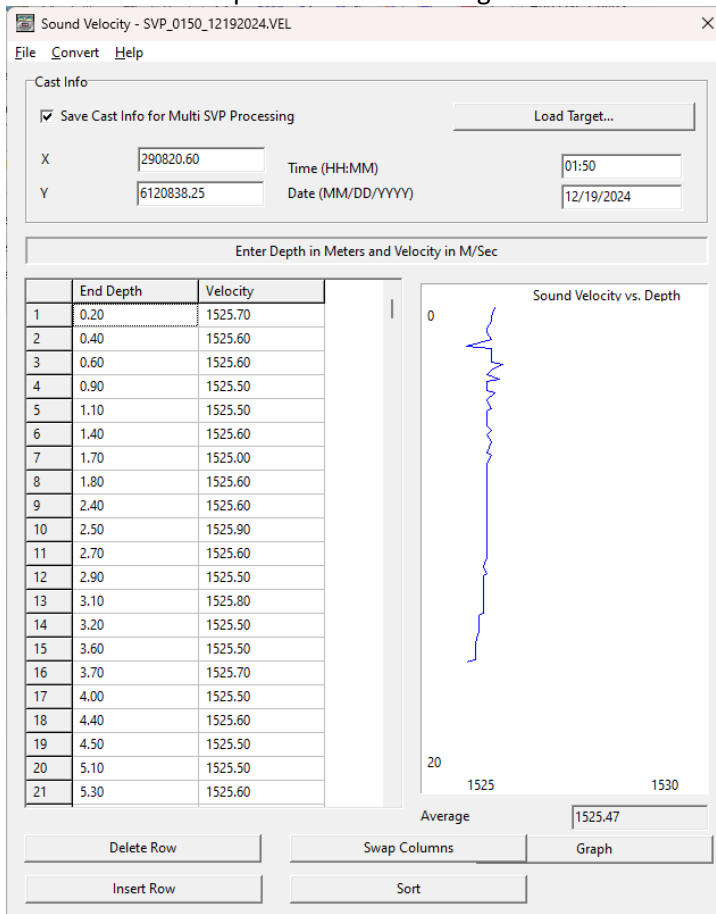
Mark	Easting	Northing	Height
Average (250 readings)	287827.092	6117655.723	5.039
SSM	287827.133	6117655.666	5.080
Difference	0.041	-0.057	0.041
1 SD	0.008	0.005	0.012
2 SD	0.016	0.010	0.024

Table 3: Benchmark position check results

As can be seen from the results above, the Base Station was outputting the correct RTK corrections.

7.2.8 Sound Velocity Profile (SVP)

Manual SVP was collected at the time of survey and applied at the time of processing. The SVP corrects any differences in the speed of sound through the water column.



8 SURVEY PARAMETERS

8.1 Line Spacing

The site was covered 100% coverage which dictated the line spacing with 120 degree swath.

8.2 Sounding Speed

The minimum ping rate during the surveys was 20Hz which can be set in the software. The vessel speed during survey was less than 6 knots (~3m/s). This meant there was a good representation of the creek bed.

8.3 Rejection Criteria for Position Data

The following standards were used to ensure correct position reliability was maintained:

Minimum Satellite Elevation:	15°
Min Satellite Count:	6
Maximum HDOP:	4
Maximum VDOP:	4
Maximum Age of Corrections:	2 seconds

Data storage would have ceased had this criterion been exceeded

8.4 Online Software Alarms

All the equipment linked to the survey system was monitored for communication errors.

- The PPS time synchronisation signal was monitored for integrity.
- The RTK system timeout -2 seconds.

If any of these systems fell outside the accepted limits then an alarm would have been raised in the system, and investigated by the survey team.

9 COVERAGE

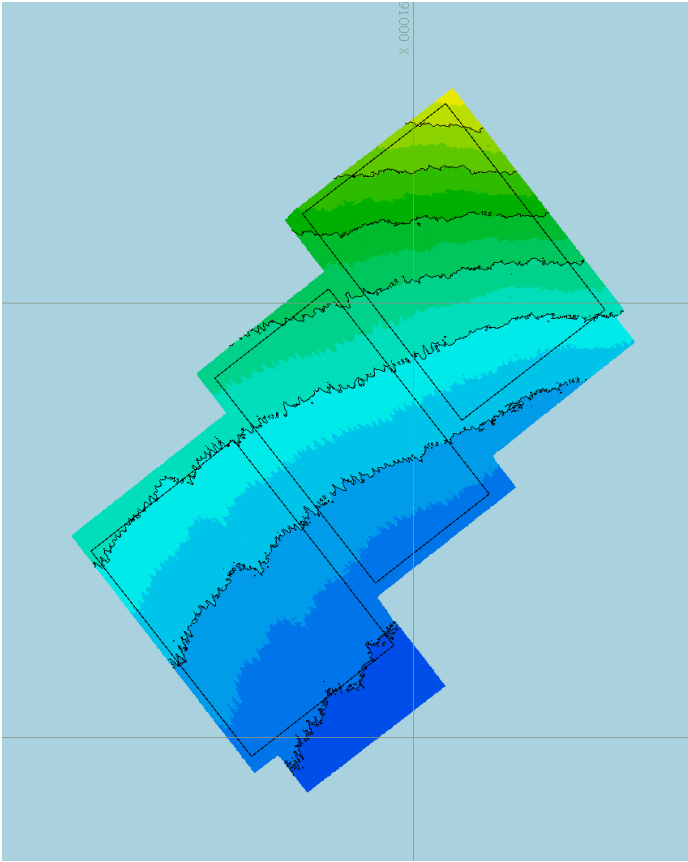


Figure 3 - Coverage Map Jervis Bay.

10 DATA DELIVERABLES

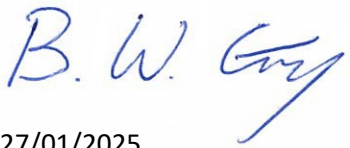
All processed data is delivered in the following formats:

Digital

- 20241218 JB Mussel Farm MGA2020_AHD 1m grid average Neg Down.laz
- 20241218 JB Mussel Farm MGA2020_AHD 2m grid Neg Down.laz
- 20241218 JB Mussel Farm MGA2020_AHD 1m grid average Neg Down.xyz
- 20241218 JB Mussel Farm MGA2020_AHD 2m grid Neg Down.xyz
- 20241218 - Jervis Bay Mussel Farm Plan 001.pdf

11 HYDROGRAPHIC SURVEYOR APPROVAL

Survey Report and Deliverables Approved By



27/01/2025

Ben Gray
Certified Professional Hydrographic Surveyor Level 1